Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A molecular detector capable of ~~for~~ detecting ~~single~~ molecules in solution comprising:

a solution reservoir;

at least one biofunctionalized nanometer-scale mechanical resonator disposed within the reservoir; and

a detector in signal communication with the at least one resonator for measuring a damping of resonance motion ~~the mechanical displacement~~ of the resonator in response to a molecular binding event on the resonator.

2. (Original) A molecular detector as described in claim 1, wherein the at least one resonator comprises a resonator selected from the group consisting of: vibrational resonators, rotational resonators, torsional resonators and composite resonators.

3. (Original) A molecular detector as described in claim 1, wherein the at least one resonator is a notched vibrational cantilever.

4. (Original) A molecular detector as described in claim 1, wherein the at least one resonator is biofunctionalized with a receptor.

5. (Original) A molecular detector as described in claim 4, further comprising a substrate disposed within the reservoir and adjacent to the at least one resonator, wherein the substrate is biofunctionalized with a ligand capable of molecular interaction with the receptor.

6. (Original) A molecular detector as described in claim 4, further comprising a substrate disposed within the reservoir and adjacent to the at least one resonator, wherein the substrate is biofunctionalized with a receptor capable of molecular interaction with a ligand wherein the ligand is capable of molecular interaction with the receptor on the resonator.

7. (Original) A molecular detector as described in claim 1, comprising at least two resonators arranged adjacent to one another, wherein at least one of the resonators is biofunctionalized with a receptor to form a receptor resonator and at least one of the resonators adjacent to the receptor resonator is biofunctionalized with a ligand capable of molecular interaction with the receptor.

8. (Currently Amended) A molecular detector as described in claim 1, comprising at least ~~two resonators~~ one additional resonator arranged adjacent to the biofunctionalized nanometer-scale mechanical resonator within the reservoir, ~~one another.~~

wherein at least one of the resonators is a driver resonator comprising a driving element capable of mechanical displacing the driver resonator at a chosen frequency, wherein the driver resonator is biofunctionalized with a receptor;

and at least one of the resonators adjacent to the driver resonator is biofunctionalized with a ligand capable of molecular interaction with the receptor on the driver resonator.

9. (Currently Amended) A molecular detector as described in claim 1, comprising at least ~~three~~ two resonators arranged adjacent to the biofunctionalized nanometer-scale mechanical resonator within the reservoir ~~one another~~,

wherein at least one of the resonators is a driver resonator comprising a driving element capable of mechanically displacing the first driver resonator at a chosen frequency;

wherein at least one of the resonators is a second driver resonator comprising a driving element capable of mechanically displacing the second driver resonator at a chosen frequency;

and at least one of the resonators is a follower resonator disposed between the two driver resonators and biofunctionalized with a ligand;

wherein the driver resonators are driven in antiphase, and wherein at least one of the driver resonators is biofunctionalized with a receptor capable of molecular interaction with the ligand on the follower resonator.

10. (Original) A molecular detector as described in claim 8 or 9 wherein the driver is a piezoelectric device.

11. (Original) A molecular detector as described in claim 1, wherein the at least one resonator is made from a material selected from the group consisting of: silicon oxide, silicon, silicon carbide and gallium arsenide.

12. (Original) A molecular detector as described in claim 1, wherein the detector is integral with the resonator.

13. (Original) A molecular detector as described in claim 1, wherein the detector is a piezoresistive transducer.

14. (Original) A molecular detector as described in claim 13, wherein the transducer is made of p+ doped silicon.

15. (Original) A molecular detector as described in claim 1, wherein the detector is an optical detector.

16. (Original) A molecular detector as described in claim 1, wherein the detector is a lock-in detector.

17. (Original) A molecular detector as described in claim 1, wherein the resonator has a thickness between about 10 nm and 1μm, a width between about 10nm and 1μm, and a length between about 1μm and 10 μm.

18. (Original) A molecular detector as described in claim 1, wherein the resonator has a resonance motion vacuum frequency between about 0.1 and 12MHz.

19. (Original) A molecular detector as described in claim 1, wherein the resonator has a force constant between about 0.lmN/m and 1 N/m.

20. (Original) A molecular detector as described in claim 1, wherein the resonator has a Reynolds number between about 0.001 and 2.0.

21. (Original) A molecular detector as described in claim 1, wherein the resonator has a mass loading coefficient between about 0.3 and 11.

22. (Original) A molecular detector as described in claim 1, having a force sensitivity of about 8fN/√Hz or greater.

23. (Currently Amended) A molecular detector as described in claim 1, wherein the at least one resonator is biofunctionalized to detect a receptor/ligand interaction.

24. (Currently Amended) A molecular detector as described in claim 1, wherein the at least one resonator is biofunctionalized to detect DNA hybridization.

25. (Currently Amended) A molecular detector as described in claim 1, wherein the at least one resonator is biofunctionalized to detect a chemical bond.

26. (Currently Amended) A molecular detector as described in claim 1, wherein the at least one resonator is biofunctionalized to detect protein unfolding.

Claims 27-32 (Canceled).

33. (New) A molecular detector as described in claim 1, wherein the at least one resonator is biofunctionalized with a ligand.

34. (New) A molecular detector as described in claim 1, wherein the detector is a detector which is adapted to measure a change in damping of resonance motion of the resonator in response to a molecular binding event on the resonator.

35. (New) A molecular detector as described in claim 1, wherein the resonator comprises a cantilever having at least two dimensions of one micron or less.

36. (New) A molecular detector as described in claim 13, wherein the detector comprises a piezoresistive detector layer which is located on the resonator.

37. (New) A molecular detector capable of detecting molecules in solution comprising:

a solution reservoir;

at least one first nanometer-scale mechanical resonator which is disposed within the reservoir, wherein the at least one first resonator is biofunctionalized with a receptor or a ligand;

a substrate or a second mechanical resonator which is disposed within the reservoir, wherein the substrate or the second resonator is biofunctionalized with another one of a receptor or a ligand which is capable of molecular interaction with the receptor or ligand on the at least one first resonator; and

a detector in signal communication with the at least one first resonator for measuring a mechanical displacement of the resonator.

38. (New) A molecular detector as described in claim 37, wherein the detector is a detector which is adapted to measure a change in force constant of resonance motion of the first resonator in response to a binding event between the receptor or ligand on the first resonator and another one of a receptor or ligand on the substrate or the second resonator such that the first resonator is tethered to the substrate or to the second resonator.

39. (New) A molecular detector as described in claim 38, wherein the detector comprises a piezoresistive detector layer which is located on the resonator.

40. (New) A molecular detector as described in claim 37, wherein the substrate is disposed in the reservoir.

41. (New) A molecular detector as described in claim 40, wherein the at least one first resonator is biofunctionalized with a ligand and the substrate is biofunctionalized with a receptor.

42. (New) A molecular detector as described in claim 40, wherein the at least one first resonator is biofunctionalized with a receptor and the substrate is biofunctionalized with a ligand.

43. (New) A molecular detector as described in claim 37, wherein the second resonator is disposed in the reservoir.

44. (New) A molecular detector as described in claim 43, wherein the at least one first resonator is biofunctionalized with a ligand and the second resonator is biofunctionalized with a receptor.

45. (New) A molecular detector as described in claim 43, wherein the at least one first resonator is biofunctionalized with a receptor and the second resonator is biofunctionalized with a ligand.

46. (New) A molecular detector as described in claim 37, further comprising a driving element capable of mechanically displacing the first resonator at a chosen frequency.

47. (New) A molecular detector capable of detecting molecules in solution comprising:

a solution reservoir;

at least one first nanometer-scale mechanical resonator which is disposed within the reservoir, wherein the at least one first resonator is biofunctionalized with a first receptor or a first ligand;

a substrate or a second mechanical resonator which is disposed within the reservoir, wherein the substrate or the second resonator is biofunctionalized with a second receptor or a second ligand, and wherein the first receptor or ligand and the second receptor or ligand are capable of binding to a third receptor or a third ligand in a solution such that the third receptor or ligand binds to both the first receptor or ligand and to the second receptor or ligand at a same time; and

a detector in signal communication with the at least one first resonator for measuring a mechanical displacement of the resonator.

48. (New) A molecular detector as described in claim 47, wherein the detector is a detector which is adapted to measure a change in force constant of resonance motion of the first resonator in response to a binding event between the third receptor or ligand and both the first and second receptors or ligands such that the first resonator is tethered to the substrate or to the second resonator.

49. (New) A molecular detector as described in claim 47, wherein the detector comprises a piezoresistive detector layer which is located on the resonator.

50. (New) A molecular detector as described in claim 47, wherein the substrate is disposed in the reservoir.

51. (New) A molecular detector as described in claim 50, wherein:

the at least one first resonator is biofunctionalized with a first receptor;

the substrate is biofunctionalized with a second receptor;

the first receptor and the second receptor are capable of binding to a third ligand in a solution such that the third ligand binds to both the first receptor and the second receptor at a same time.

52. (New) A molecular detector as described in claim 47, wherein the second resonator is disposed in the reservoir.

53. (New) A molecular detector capable of detecting molecules in solution comprising:

a solution reservoir;

at least one biofunctionalized nanometer-scale mechanical resonator disposed within the reservoir; and

a means for measuring a damping of resonance motion of the resonator in response to a molecular binding event on the resonator.

54. (New) A molecular detector as described in claim 53, wherein the means for measuring comprises a means for measuring a change in damping of resonance motion of the resonator in response to a molecular binding event on the resonator.

55. (New) A molecular detector capable of detecting molecules in solution comprising:

a solution reservoir;

at least one biofunctionalized nanometer-scale mechanical resonator disposed within the reservoir;

a modifier to which the resonator can be bound by a molecular binding event; and

a detector in signal communication with the at least one resonator for measuring a change in force constant of resonance motion of the resonator in response to a molecular binding event between the resonator and the modifier.

56. A molecular detector as described in claim 55, wherein the modifier comprises a biofunctionalized substrate or a biofunctionalized second mechanical resonator.

57. A molecular detector as described in claim 55, wherein the modifier comprises a large molecule which alters a viscous drag on the at least one biofunctionalized nanometer-scale mechanical resonator.

58. A molecular detector as described in claim 57, wherein the large molecule comprise a dendrimer containing a ligand adapted to bind to the at least one biofunctionalized nanometer-scale mechanical resonator.

59. (New) A molecular detector capable of detecting molecules in solution comprising:

a solution reservoir;

at least one biofunctionalized nanometer-scale mechanical resonator disposed within the reservoir;

a first means for binding to the resonator; and

a second means for measuring a change in force constant of resonance motion of the resonator in response to a molecular binding between the resonator and the first means.

60. (New) A molecular detector as described in claim 59, wherein the second comprises a means for measuring a change in the force constant of resonance motion of the resonator in response to a binding event which causes the resonator to become tethered to a substrate or to another resonator.